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(54) **VACUUM DEVICE FOR LENS MODULE ASSEMBLY**

(71) Applicant: **HON HAI PRECISION INDUSTRY CO., LTD.**, New Taipei (TW)

(72) Inventor: **Chih-Hao Chu**, New Taipei (TW)

(73) Assignee: **HON HAI PRECISION INDUSTRY CO., LTD.**, New Taipei (TW)

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(52) **U.S. Cl.**
CPC ***B25B 11/007*** (2013.01); *Y10T 29/53991* (2015.01)

(58) **Field of Classification Search**
USPC 29/282, 283; 359/811, 818, 819
See application file for complete search history.

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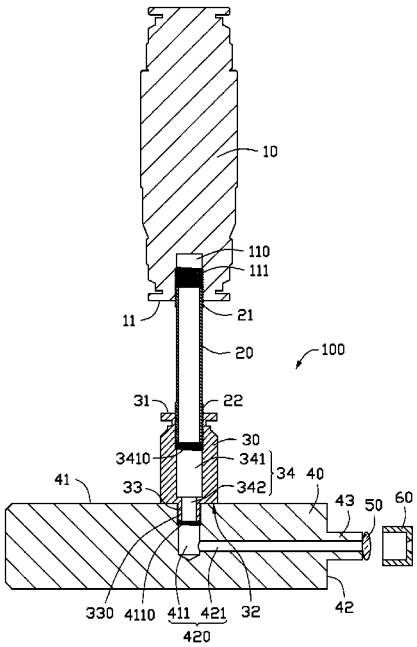
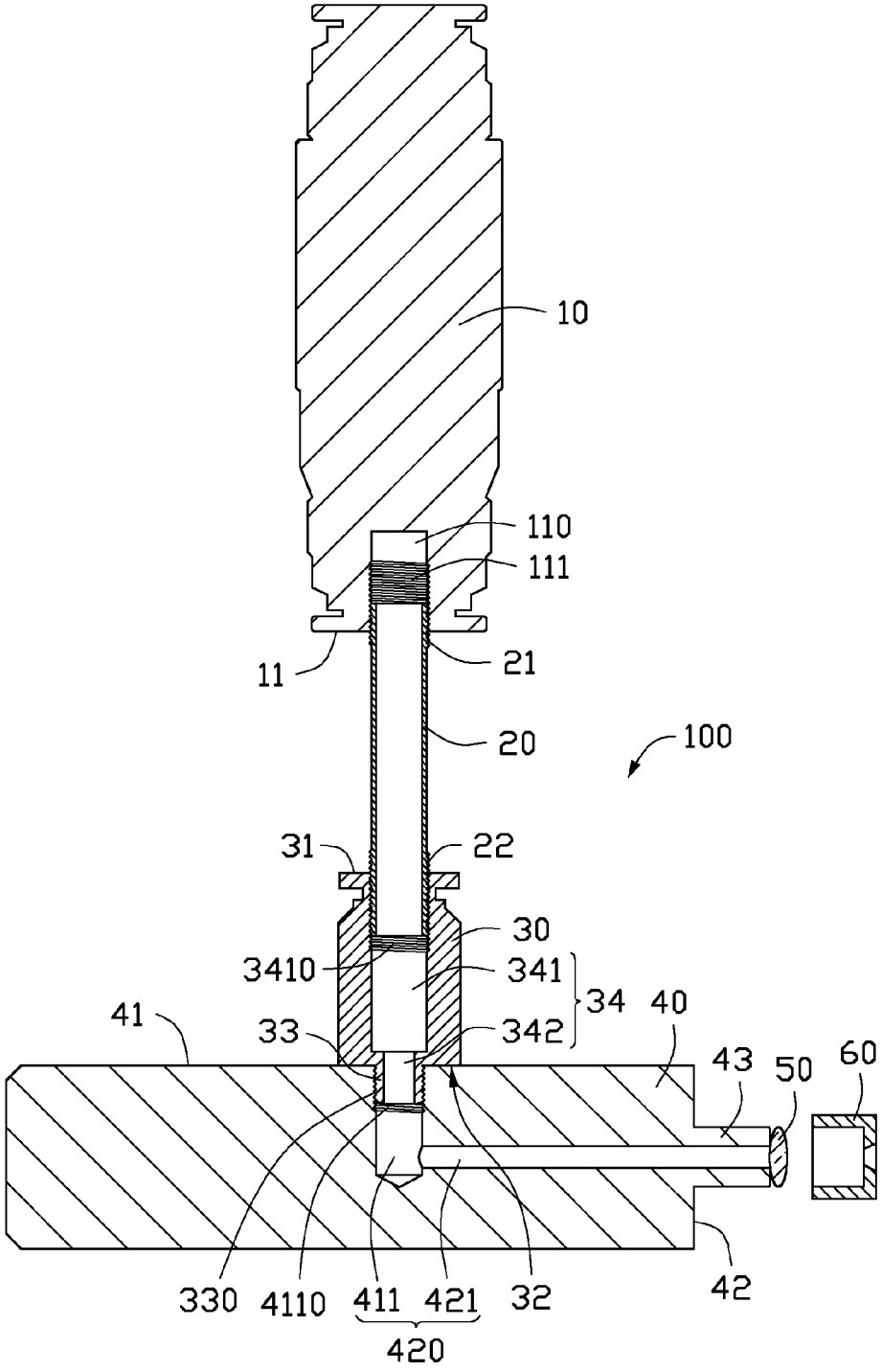
Primary Examiner — Lee D Wilson
Assistant Examiner — Shantese McDonald
(74) *Attorney, Agent, or Firm* — Novak Druce Connolly Bove + Quigg LLP

(57) **ABSTRACT**

A vacuum device includes a vacuum generator, a guiding pipe, a connection member, and a stand. One end of the guiding pipe is connected to the vacuum generator. One end of the connection member is connected to the other end of the guiding pipe. The other end of the connection member is connected to the stand. The stand includes a top surface, a first sidewall connected to the top surface, and a pressing portion extending outward from the first sidewall. The connection member is supported by the top surface. The stand defines a first hole and a second hole communicating with the first hole. The first hole runs through the top surface and meets the connection member and the guiding pipe. The second hole runs through the first sidewall and the pressing portion.

15 Claims, 1 Drawing Sheet

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VACUUM DEVICE FOR LENS MODULE ASSEMBLY

BACKGROUND

1. Technical Field

The present disclosure relates to vacuum devices, and particularly to a vacuum device for assembling a lens module.

2. Description of Related Art

Lens modules are key members of a camera. A lens module includes a lens barrel with a lens received in the lens barrel. In assembly, firstly, the lens is held by a clip. Then, a circumferential surface of the lens is applied with glue by a glue needle. Finally, the lens is inserted into the lens barrel. However, the lens may be scratched by the clip, which would damage the lens. In addition, it is precision-demanding work to fit the lenses correctly in the lens barrel. Often the precision is low, thereby affecting the quality.

Therefore, it is desirable to provide a vacuum device that can overcome the above-mentioned limitations.

BRIEF DESCRIPTION OF THE DRAWINGS

Many aspects of the present disclosure can be better understood with reference to the following drawing. The components in the drawing are not necessarily drawn to scale, the emphasis instead being placed upon clearly illustrating the principles of the present disclosure.

The FIGURE is a schematic cross-section of a vacuum device, according to an exemplary embodiment.

DETAILED DESCRIPTION

The FIGURE shows a vacuum device **100** configured to assemble a lens **50** into a lens barrel **60**.

The vacuum device **100** includes a vacuum generator **10**, a guiding pipe **20**, a connection member **30**, and a stand **40**. One end of the guiding pipe **20** is connected to the vacuum generator **10**, while the other end of the guiding pipe **20** is connected to one end of the connection member **30**. The other end of the connection member **30** is connected to the stand **40**.

The vacuum generator **10** includes a connection surface **11**. The connection surface **11** defines a receiving cavity **110** for receiving the guiding pipe **20**. The vacuum generator **10** includes first internal threads **111** formed on an internal wall of the receiving cavity **110**.

The guiding pipe **20** includes first external threads **21** and second external threads **22**. The first external threads **21** are formed on one end of the guiding pipe **20**. The second external threads **22** are formed on the other end of the guiding pipe **20**. The first external threads **21** engage with the first internal threads **111**, such that one end of the guiding pipe **20** is received in the receiving cavity **110**.

The connection member **30** includes a first connection end **31** and a second connection end **32** away from the first connection end **31**. The connection member **30** includes a gas guiding portion **33** extending substantially perpendicularly downward from the second connection end **32** and into the stand **40**.

The connection member **30** defines a gas guiding hole **34** running through the first connection end **31**, the second connection end **32**, and the gas guiding portion **33**. The gas guiding hole **34** is stepped, and includes a gap input hole **341** and a gap output hole **342** communicating with the gap input hole **341**. Both the gap input hole **341** and the gap output hole **342** are substantially circular. A diameter of the gap input hole **341** is larger than a diameter of the gap output hole **342**.

The connection member **30** includes second internal threads **3410** formed on an internal wall of the gap input hole **341**. The second internal threads **3410** engage with the second external threads **22**, such that the other end of the guiding pipe **20** is received in the gap input hole **341** of the connection member **30**.

In the embodiment, the gap output hole **342** is defined in the gas guiding portion **33**. The connection member **30** includes third external threads **330** formed on an external wall of the gas guiding portion **33**.

The stand **40** includes a top surface **41** connected to the second connection end **32** of the connection member **30**, and a first sidewall **42** connected substantially perpendicularly to the top surface **41**. The stand **40** includes a pressing portion **43** extending substantially perpendicularly outward from the first sidewall **42**. The pressing portion **43** has a shape and size corresponding to an internal portion of the lens barrel **60**, such that the pressing portion **43** can be inserted into the internal portion of the lens barrel **60**. The stand **40** defines an L-shaped hole **420**. The L shaped hole **420** includes a first hole **411** and a second hole **421**. The first hole **411** is substantially perpendicular to the second hole **421**. The first hole **411** communicates with the second hole **421**. The first hole **411** runs substantially perpendicularly through the top surface **41**, and communicates with the gas guiding hole **34**. The second hole **421** runs through the first sidewall **42** and the pressing portion **43**. Both the first hole **411** and the second hole **421** are substantially circular. A diameter of the first hole **411** is larger than a diameter of the second hole **421**.

The stand **40** includes third internal threads **4110** formed on an internal wall of the first hole **411**. The third internal threads **4110** engage with the third external threads **330**, such that the gas guiding portion **33** is received in the first hole **411**, and the second connection end **32** is supported by the top surface **41**.

In assembly, firstly, one end of the guiding pipe **20** is received in the vacuum generator **10**. Then, the other end of the guiding pipe **20** is received in the gas guiding hole **34**. Finally, the gas guiding portion **33** of the connection member **30** is received in the first hole **411**. Therefore, the connection member **30** is connected to the stand **40**.

In use, firstly, the circumferential surface of the lens **50** is coated with glue by a glue needle (not shown). Then, an operator holds the vacuum generator **10** and turns on the vacuum generator **10**. The vacuum generator **10** generates vacuum, such that the pressing portion **43** adheres to the lens **50**. Finally, the pressing portion **43** is inserted into the lens barrel **60** to glue the lens **50** into the lens barrel **60**.

It is noteworthy that, in alternative embodiments, the vacuum generator **10** can be attached to the guiding pipe **20** by an adhesive, by plastic welding, or by other attaching methods.

It is noteworthy that, in alternative embodiments, the guiding pipe **20** can be attached to the connection member **30** by an adhesive, by plastic welding, or by other attaching methods.

It is noteworthy that, in alternative embodiments, the connection member **30** can be attached to the stand **40** by an adhesive, by plastic welding, or by other attaching methods.

It will be understood that the above particular embodiments are shown and described by way of illustration only. The principles and the features of the present disclosure may be employed in various and numerous embodiment thereof without departing from the scope of the disclosure as claimed. The above-described embodiments illustrate the possible scope of the disclosure but do not restrict the scope of the disclosure.

What is claimed is:

1. A vacuum device for assembling a lens into a lens barrel, the vacuum device comprising:

a vacuum generator;

a guiding pipe, one end of the guiding pipe connected to and communicating with the vacuum generator;

a connection member, one end of the connection member connected to the other end of the guiding pipe, the connection member communicating with the guiding pipe; and

a stand, one end of the stand connected to the other end of the connection member, the stand communicating with the connection member, the stand comprising a top surface, a first sidewall connected to the top surface, and a pressing portion extending outward from the first sidewall, the connection member supported by the top surface, the stand defining a hole, the hole comprising a first hole and a second hole communicating with the first hole, the first hole running through the top surface and communicating with the connection member, the second hole running through the first sidewall and the pressing portion.

2. The vacuum device of claim **1**, wherein the hole is substantially L shaped, the first hole is substantially perpendicular to the second hole.

3. The vacuum device of claim **1**, wherein the vacuum generator comprises a connection surface connected to the guiding pipe, the connection surface defines a receiving cavity, the vacuum generator comprises first internal threads formed on an internal wall of the receiving cavity, the guiding pipe comprises first external threads formed on one end of the guiding pipe, the first external threads engage with the first internal threads, one end of the guiding pipe is received in the receiving cavity.

4. The vacuum device of claim **3**, wherein the guiding pipe comprises second external threads formed on the other end of the guiding pipe, the connection member comprises a first connection end and a second connection end away from the first connection end, the connection member comprises a gas guiding portion extending from the second connection end and into the stand, the connection member defines a gas guiding hole running through the first connection end, the second connection end and the gas guiding portion, the connection member comprises second internal threads formed on an internal wall of the gas guiding hole, the second internal threads engage with the second external threads, the other end of the guiding pipe is received in the gas guiding hole.

5. The vacuum device of claim **4**, wherein the gas guiding portion extends substantially perpendicularly from the second connection end.

6. The vacuum device of claim **4**, wherein the gas guiding hole is stepped, and comprises a gap input hole and a gap output hole communicating with the gap input hole.

7. The vacuum device of claim **6**, wherein the second internal threads are formed on an internal wall of the gap input hole.

8. The vacuum device of claim **6**, wherein the other end of the guiding pipe is received in the gap input hole.

9. The vacuum device of claim **6**, wherein both the gap input hole and the gap output hole are circular, a diameter of the gap input hole is larger than a diameter of the gap output hole.

10. The vacuum device of claim **6**, wherein the gap output hole is defined in the gas guiding portion.

11. The vacuum device of claim **10**, wherein the connection member comprises third external threads formed on an external wall of the gas guiding portion, the stand comprises third internal threads formed on an internal wall of the first hole, the third internal threads engage with the third external threads, the gas guiding portion is received in the first hole with the second connection end supported by the top surface.

12. The vacuum device of claim **1**, wherein both the first hole and the second hole are circular, a diameter of the first hole is larger than a diameter of the second hole.

13. The vacuum device of claim **1**, wherein the vacuum generator is attached to the guiding pipe by an adhesive or by plastic welding.

14. The vacuum device of claim **1**, wherein the guiding pipe is attached to the connection member by an adhesive or by plastic welding.

15. The vacuum device of claim **1**, wherein the connection member is attached to the stand by an adhesive or by plastic welding.

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